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Climatology of African Easterly Waves

2010

Abstract: Approximately 60% of Atlantic tropical storms originate from AEWs and nearly 85% of all intense hurricanes (categories 4 and 5) have their origins as an easterly wave. A climatological data set of AEWs is needed to enhance understanding of the processes responsible for tropical cyclogenesis and to improve the prediction capability of genesis. When examined on a seasonal basis, AEWs can provide an important link between seasonal North Atlantic tropical cyclone characteristics and climate teleconnection patterns including modes of Atlantic and Pacific variability. However, there is presently no climatological data set for AEWs. We have designed an objective, physically based tracking algorithm for AEWs. Using this tracking algorithm, we have developed an AEW dataset from 1980 to 2001 using ERA-40 reanalysis and OLR. We propose to extend this dataset forward in time using both the ERA-Interim and NCEPNCAR reanalyses, and backwards in time using the NCEP-NCAR reanalysis. We will use historical GOES data to extend the dataset back to 1966 and will test the uncertainty of the tracking scheme without including OLR data to see if useful tracking results can be obtained back to 1948, the start date of the reanalysis. For each AEW, the data set will include date of occurrence, average speed, propagation path, intensity when leaving the African continent and along the path, and approximate wavelength. The AEW dataset will be further integrated with HURDAT hurricane data to identify waves that developed into tropical cyclones. To test and demonstrate the utility of the AEW dataset, we will conduct studies relating AEWs to tropical cyclogenesis using the HURDAT dataset (under separate NSF funding), and we will examine the interannual and interdecadal variability of AEWs in the context of known climate teleconnection patterns including modes of Atlantic variability (Atlantic Nino-NAO-AMO-AMM) and Pacific variability (ENSO-NPGO-PDO). Given that a portion of AEWs enter the Eastern Pacific basin, we will also use the tracking algorithm to generate a separate data set of easterly waves in this basin. Comparisons of both data sets will serve to obtain a better estimate of the portion of waves that travel from the Atlantic to the Pacific as well as those that originate insitu. Detection of Pacific easterly waves is also important for the United States since during the summer months, these waves can extend northward as far as the desert southwest producing spells of intensified shower activity within the summer monsoon.